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GEOLOGY AND PALÆONTOLOGY.

GEOLOGY OF LOWER MERION AND VICINITY.—My attention has just been called to the articles in the May number of the NATURALIST by Dr. Frazer, and in the June number by Mr. Hall, on the Geology of the Chester valley and vicinity.

On page 523, Dr. Frazer has evidently written without examining the paper referred to (Acad. Nat. Sci. Phila. Nov., 1878), or the map, when he credits me with calling the belt S. of the limestone of Gulf creek the second and that at Paoli the third of "approximatively parallel beds," nor can I believe either he or Mr. Hall has ever examined the northerly belt which lies about one-quarter of a mile north of the outcrop of the belt east of Radnor station, and with a strike approximatively parallel.

If the serpentine outcrops between Radnor station and Paoli were described, as Dr. Frazer intimates, it is to be regretted that he did not refer to such descriptions. If they were not described, but were *well known*, is it improper to describe them, if they were erroneously set out in the only recent map published, to my knowledge, a map issued by one connected with the geological survey of the State, and of very recent date, when my paper was written, and this even if they were correctly delineated upon an *unissued* map?

Dr. Frazer thinks the connecting of the serpentine areas in Radnor, Easttown, &c., by a straight line curved at its eastern extremity a mere matter of judgment, while I do not understand him to dispute the correctness of my map, which shows the actual outcrops to be at angles with Mr. Hall's line almost throughout.

Few geological problems are difficult of solution if we may but fill a gap of two miles exhibiting constant surface indications of certain rocks by the imaginary existence of other rocks of which there are no indications.

Dr. Frazer states that much of the area called serpentine (in this region) has little to ally it to that mineral. Supposing the term serpentine to be used in its generic sense as a rock and as including steatite, talc, chlorite, &c., as distinguished from the adjacent gneiss, mica schist, and quartzite, and not in its restricted mineralogical sense, my observations do not agree with this.

Will he mention an outcrop in Lower Merion, Radnor, or Upper Merion at which one would find any difficulty in distinguishing the serpentine from the rocks bounding it? More than this, the rocks of some of the outcrops not shown in C 6 are precisely the same rocks which make the outcrops that *are* shown.

It may be that the sandstone and sand beds on the north flank of the South Valley hill and the associated iron ores are not Potsdam, but inasmuch as east of the Schuylkill the Potsdam occurs in precisely that position, this extensive deposit is at least worthy of mention. Masses of sandstone of tons weight are not "sandy beds."

The remark as to the serpentine belt swinging around towards Chester I did not attribute to Mr. Hall. I was criticizing no individual. I was simply pointing out what my observation convinced me were conspicuous errors in Vol. C 6 of the Geological Survey.

If on page 525 it is intended to convey the impression that I was guilty of plagiarism, or at least of failure to give due credit to Dr. Frazer, I would offer as my apology the fact that my article was read December 23, 1881, and published in April, 1882, while his was read A. P. S. Dec. 15, 1882, eight months later.

The statement, page 528, that C 6 did not appear until late in 1882 is certainly erroneous. It bears the imprint 1881, and was in our libraries in December, 1881, hence the inference deduced, that the imprint on the Proceedings of the Section is an error is likewise a mistake.

Dr. Frazer says: "The map is quite obscure, and it is difficult to ascertain whether the section given lies in Chester or Delaware county."

The map is distinctly stated upon its face to be of *Lower Merion and vicinity*. The township lines between Lower Merion, Radnor, and Upper Merion townships and Chester county are all distinctly given and named upon the map. It was presumed that those interested in the subject were aware in what counties those townships were. The section line is clearly delineated as passing through Radnor township into Lower Merion.

I regret exceedingly if I have ignored the work of any one in this field, and if I have, I have sinned through ignorance and through supposing that in C 6 was to be found the knowledge of the region up to the date of its publication.

In natural science the first thing to obtain is facts, and in a region as geologically obscure as that south of the Chester valley every fact in regard to the rocks should be welcomed by every one desiring scientific truth rather than to sustain theories, whether such facts be ascertained by the members of the Geological Survey or by an obscure individual. Let the facts be examined critically, but if they are facts they should not be rejected, belittled, or ignored by one who does not state that he has examined into them and who does not seem to have read the papers in which they are set forth.

Two observers go over the same ground. One examines "*every outcrop* at least once," and publishes a map thereof; the other, while not pretending to have done such thorough work, describes many serpentine outcrops which the first did not, but finds mica schists in two places where the first found serpentine. Now it is very easy for a third, who has not examined these outcrops, to suggest that the only explanation is that what one observer would regard as evidence of a serpentine outcrop another would not; but is such explanation, without inspection, scientific? It is certainly not highly complimentary to the gentlemen referred to to suggest that they cannot distinguish between mica schist or gneiss and serpentine. Will a similar explanation suffice for the omission of the very extensive porphyritic gneiss belt in Philadelphia and Lower Merion?

To set this question at rest, it is my purpose to exhibit at an early fall meeting of the Academy of Natural Sciences a suite of specimens from these outcrops, that those interested may see for themselves.

If it is seriously urged that a continuous valley clearly synclinal at each end is monoclinal in the middle of its length, it may not be so very unwise or unfortunate, as Mr. Hall asserts, to endeavor in that "middle to unravel a snarl in the tangled skein."

In defence of the Mineralogical and Geological Section, if defence be needed, I would only say that had all its *other* founders and members contributed as extensively to it as has its critic there would have been nothing to criticise.—*Theo. D. Rand, Phila., June 20, 1883.*

HULKE ON ICHTHYOSAURUS AND PLESIOSAURUS.—In the course of an anniversary address delivered before the London Geological Society in February of this year, the president, J. W. Hulke, took occasion to pass in review the homologies of the elements of the shoulder-girdle in the Ichthyopterygia and the Sauropterygia (Plesiosaurus, Elasmosaurus, Colymbosaurus, Nothosaurus). The coracoids and scapulæ are easily identified in both types, but the bones which in the latter order have been by some considered to be clavicles, are by their endosteal ossification and exact homology with the precoracoids of Chelonia, proved to be precoracoids; while the so-called interclavicle of the Sauropterygia lies on the upper or visceral surface of the coracoids and precoracoids, and shows traces of a primitive composition of two similar halves. These points seem to homologize it with the omosternum of existing Batrachia.

Thus the shoulder-girdle of Ichthyosaurus consists of coracoids, scapulæ, clavicles and interclavicle; while in that of the Sauropterygia, precoracoids and omosternum replace the two latter elements. Professor Hulke believes therefore that the association of the two orders in one sub-class is not expressive of a direct common ancestry. Good characters for distinguishing the apparently numerous species of Ichthyosaurus and Plesiosaurus are hard to find, and Professor Hulke believes that the characters on which the genus Pliosaurus is founded have little value. The Pliosaurian form of paddle was actually possessed by *Plesiosaurus manseli.* The "os intermedium" is traced from a position between the radius and ulna (epipodial) in Plesiosaurus to a mesopodial (tarsal or carpal) position in Ichthyosaurus.

SOME NEW MAMMALIA OF THE PUERCO FORMATION.—At a recent meeting of the Philadelphia Academy, Professor Cope stated that he had recently received from the Puerco beds of New Mexico remains of a number of individuals of the extinct mammal he had named *Periptychus ditrigonus*.[1] Besides jaws and teeth with permanent and temporary dentition in good preservation, the pelvis, femur and tibia are included in the specimens. These show that the species must be referred to the genus Conoryctes Cope, and render it very probable that the genus belongs to the family of the Periptychidæ. The absence of ungual phalanges prevents absolute certainty. The genus is near Periptychus, but differs in the one root and simple conic crown of the second true molars in both jaws, and the presence of cingular cusps of the superior molars, exterior to the external tubercles. *Conoryctes ditrigonus* has the molars of both jaws larger than those of the *C. comma*, and there is less difference in size between the posterior and anterior teeth than in that species.

The following new species accompanied the above: *Periptychus coarctatus*, *Pantolambda cavirictus* and *Zetodon gracilis*, gen. nov. The second named is the largest mammal of the Puerco epoch yet known, equaling a full-sized tapir in its jaws. The genus Zetodon was thus defined. The true molars consist of narrow crescents in two pairs, which are both concave towards each other, embracing a fossa. The posterior crescents soon unite on attrition, closing the fossa, while the anterior are well separated, and only unite by their anterior apices. Each has a small, columnar heel. Fourth premolar with the posterior pair of crescents only, which soon unite. The anterior pair is represented by a part of the external one which forms a narrow lobe. The heel is larger than in the true molar.

The position of this genus it is impossible to determine from the specimens obtained. It may be Marsupial or Condylarthrous, and, if the latter, one of the Meniscotheriidæ; but if not of these groups, its position is not likely to be in any known order of the Tertiary periods.

GEOLOGICAL NOTES.—*General.*—The reports of the British subcommittees of the International Geological Commission show that geologists are much at variance in their ideas as to the relation of the Permian and Trias to each other, to the carboniferous series below, and to corresponding series in other areas; that the existence of Miocene beds in Great Britain is at best doubtful, that the term "oligocene" is rather a convenience than the expression of a fact; and that exact agreement as to the titles and classification of the late pre and post-glacial strata is hopeless.——R. Lydekker, in his synopsis of the fossil vertebrata of India, records the presence of fishes in the "*Productus* limestone," which roughly corresponds to the Carboniferous of Europe; of Batrachia in the Trias-jura; and of Reptilia as low as the "Panchet group of the Gondwanas," probably triassic. Remains of birds have hitherto only been found in the Himalayan Siwaliks, and in one instance in Sind; while no traces of mammals have yet been detected below the eocene, and the great majority are pliocene.

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[1] Proceed. Amer. Philos. Society, 1882, p. 465.

Carboniferous.—M. Ch. Brongniart (Bull. de la Société Geol. de France) describes *Titanophasma fayoli*, an insect from Commentry, France, differing from recent Phasmidæ chiefly in the proportions of the parts of the thorax. The prothorax is equal in length to the meso and metathorax, while in recent species the mesothorax is longer than the other two parts. The total length of the insect was about 10″. M. Brongniart gives a list of 111 insects that have been described from carboniferous strata, including the present species and *Protophasma dumasii*, and adds that he has 440 additional species from Commentry, to be described ere long; out of this total of 551, 362 are Blattidæ.

Jurassic.—Professor J. W. Hulke has published in the Transactions of the Royal Society what he styles an "attempt" at a complete osteology of *Hypsilophodon foxii*, a British Wealden Dinosaur. As the restoration is made by so competent a hand from an extensive series of remains, in which the bones often maintain their normal connections, it may be accepted as authoritative. Hypsilophodon was adapted to climbing on rocks and trees, and its manus is more generalized and more lizard-like than that of Iguanodon. It is represented in a quadrupedal position. The manus, as shown by the figure of a forearm in the British Museum, has five digits.

Cretaceous.—M. L. Dollo, in a third note upon the dinosaurs of Bernissart, reproduces *Iguanodon bernissartensis*, reviews the arguments respecting its attitude when alive, and concludes in favor of its bipedal position and aquatic habits, thus accepting the views of both Owen and Cope.

Tertiary.—Bulletin No. 3, from the Princeton College Museum, contains notes upon the skull of the eocene rhinoceros, Orthocynodon, discovered in the Bridger beds in 1878. Professors Scott and Osborn consider this the earliest member of the rhinoceros group, and forms the family Amynodontidæ for the reception of it and Amynodon. Hyrachyus is stated to have been the common ancestor of four distinct lines of Perissodactyls. According to all present evidences, the rhinoceros group originated in North America.——Achænodon, discoursed upon in the same bulletin by Professor Osborn, is supposed by him to be the oldest of the pig family yet discovered. The carnivorous characters of the skull, in many respects quite ursine, are noted, and it is stated that many eocene Perissodactyls also have this peculiarity.——Another paper contains observations on the brain casts of tertiary mammals, by A. T. Bruce. *Megencephalon primævus* had a comparatively large and well-convoluted cerebrum, apparently covering most of the cerebellum. On the whole, the casts proved that the brains of tertiary mammals were smaller and less convoluted than those of existing mammals. The last paper in the bulletin is by Professor Scott, upon *Desmatotherium guyoti*, a Lophiodont from the Bridger Eocene, closely allied to Hyrachyus; and *Dilophodon minusculus*, one of the smallest known Lophiodonts, and also closely allied to Hyrachyus.——R. Lydekker has defined the family Camelopardalidæ so as to include six fossil genera, commencing with the existing giraffe, and proceeding through the forms Orasius, Vishnutherium, Helladotherium, Hydaspitherium and Bramatherium, to Sivatherium, the length of the limbs and neck, on the whole, diminishing downward. This view differs from that of Mivart, who places Sivatherium near the prong-buck and Saiga. The long-limbed *Camelopardalis sivalensis* was a contemporary of the short-limbed Sivathere, so that the evolution of the long-limbed form must have been in an earlier epoch.

Post-tertiary.—Professor H. C. Lewis has published an abstract of a lecture on " The great Ice age in Pennsylvania." In it he states that " there is every proof that, ages ago, * * * the great Greenland glacier crept down so as to overspread the north-eastern part of America and the north-western part of Europe." He treats of this northern glacier as a sheet reaching from " Greenland to St. Louis, and from Alaska to New Jersey, so thick as to overtop Mt. Washington," estimates its thickness in New England at 5000 feet, and gives reasons for supposing that the melting of the glacier need not be longer than from 10,000 to 15,000 years ago. In a lecture upon the geology of the neighborhood of Philadelphia, he defines the alluvium, Trenton gravel, brick clay, red and yellow gravels, etc., and traces their history.

BOTANY.[1]

THE GROWTH OF PLANTS IN ACID SOLUTIONS. I.—The watering of plants with alkaline solutions, soluble phosphates, and organic extracts has been very extensively and variously experimented upon, but any comparative examination of a series of plants treated under the same conditions with acid waters has not to my knowledge been published. The experiments described below originated in an inquiry as to what extent acids would affect vegetation, and whether apprehensions aroused by the reported destruction of trees through acid precipitation from manufactures were justified.

The plants experimented with were specimens of the silver-leaf geranium, so commonly used in combination with the fish geranium in ornamental flower beds, both being varieties of the same

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[1] Edited by PROF. C. E. BESSEY, Ames, Iowa.